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ABSTRACT

Building maintenance is a basic two-year trade education course requiring 2 1/2 hours of study on each of 160 teaching days per year. Student abilities should range from those capable of the simplest custodial work to those who may eventually be superintendents of building complexes. The syllabus is organized in sections by traditional skills groupings (custodial services, grounds maintenance, redecorating, carpentry, masonry, electricity, plumbing, climate control, drawings and specifications, bookkeeping and estimating). A two-column format lists course content with suggested audiovisuals and methodology. Appended are lists of texts, references, and audiovisuals; a source directory; and a list of tools and equipment considered to be the minimum necessary for a class group of 20 students. (MS)

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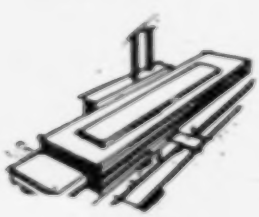

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BUILDING MAINTENANCE

SYLLABUS

The University of the State of New York/The State Education Department
Bureau of Secondary Curriculum Development/Albany, New York 12224/1973

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FOREWORD

The rapid increase in population, with attendant proliferation of schools, shopping centers, and industrial and residential complexes has created a need for many people skilled in cleaning and maintaining property. Concurrently, the expansion of occupational education allowed a change in emphasis from a few narrow skill areas, available to those whose ability matched requirements of such study, to many broad occupational clusters wherein students of nearly all ability levels can be prepared for employment. *Building Maintenance* exemplifies such a cluster.

In the spring of 1971, teachers of building maintenance courses in selected geographical areas were contacted regarding organization of a syllabus. During that summer Donald Conklin of Rockland BOCES, Richard Jones of Oneida-Madison-Herkimer BOCES, and Edwin Smith of Chemung-Schuyler-Tioga BOCES, met with Charles Stebbins, Associate, Bureau of Trade and Technical Education, and Joseph Messier, Associate in Vocational Curriculum, Bureau of Secondary Curriculum Development, to create a first-draft manuscript. A second draft, incorporating sample performance objectives and expanded teaching suggestions, was prepared by Joseph Fischer of Albany (City) Vocational Center, and Mr. Messier during the summer of 1972, and evaluated by State Education Department personnel and a teacher committee. A final draft, revised to reflect the evaluation, became this syllabus in *Building Maintenance*.

G. Earl Hay, *Supervisor*
Vocational Curriculum Unit
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Gordon E. Van Hooft, *Director*
Division of Curriculum Development

TO THE TEACHER

Building Maintenance is a basic 2-year trade education course requiring 2 1/2 hours of study on each of 160 teaching days per year. The broad scope of the subject matter and the multilevel skill structure of subsequent employment, open this course to well-motivated students of nearly all levels of ability. Student abilities should range from those whose employment prospects are the simplest custodial work under close supervision, to those who, with experience and some advanced education, may eventually be superintendents of building complexes —— residential, commercial, or industrial —— or own a private maintenance contracting business.

The syllabus is organized in sections by traditional skills grouping. This is not a teaching progression. The teacher using the syllabus to write a course of study reflecting local conditions must select content from the syllabus, organizing it in a teaching order which best serves his situation. The suggested time allocations, based on "average-ability," must also be adapted to the particular teaching situation.

A two-column format is used. The first column lists the course content; the second column contains suggested audiovisuals and methodology. Neither column is prescriptive. The teacher is expected to vary the content to fit the abilities and aspirations of each individual student. The teaching suggestions are intended to stimulate the teacher's ingenuity and resourcefulness in tailoring instruction to each individual.

Appended are lists of texts, references, and audiovisuals; a source directory; and a list of tools and equipment considered to be the minimum necessary for a class group of 20 students. A section demonstrating several levels of performance objectives for a selected unit of instruction, as it should appear in a teacher's course of study, begins on page one. This sample should be carefully studied before proceeding to use of the syllabus.

Carl G. Benenati, *Chief*
Bureau of Trade and Technical Education

Robert H. Bielefeld, *Director*
Division of Occupational Education Instruction

CONTENTS

	Page
FOREWORD	iii
TO THE TEACHER	iv
USING THE SYLLABUS	1
CUSTODIAL SERVICES	7
GROUNDS MAINTENANCE	15
REDECORATING	18
CARPENTRY	23
MASONRY	28
ELECTRICITY	33
PLUMBING	36
CLIMATE CONTROL	41
DRAWINGS AND SPECIFICATIONS	45
BOOKKEEPING AND ESTIMATING	47
RESOURCE LIST	49
SOURCE DIRECTORY	58
SUGGESTED EQUIPMENT	60

USING THE SYLLABUS

The course content of this syllabus was selected by a committee of experienced teachers as
be taught to the student of average abilities —— the student who can become proficient in all
and in the supervision of other workers. Less talented students should be evaluated on mastery
of the content which is within their employment capabilities. More talented students should re
administering a maintenance department or service, as well as attaining proficiency in the cour

The teacher of building maintenance could then, be responsible for a class group which wil
several, or all of the following ability/employability groupings:

Trainable	Closely supervised institutional service.	Basic cleaning of floor glass, and outside area
Educable	Generally supervised industrial, commercial, educational complex service.	The above tasks, plus o simpler machines such a polishers, lawn mowers, throwers, and power swe
Average	Loosely supervised general service, requiring much independent responsibility.	All above, plus invento orders, customer relati some supervision of oth
Talented	General service of a supervisory and administrative or totally independent responsibility.	A.' above, plus duties apartment or office bui superintendent and of t superintendent of a bui

USING THE SYLLABUS

ent of this syllabus was selected by a committee of experienced teachers as that which should udent of average abilities —— the student who can become proficient in all maintenance duties, ion of other workers. Less talented students should be evaluated on mastery of only that part n is within their employment capabilities. More talented students should receive instruction in ntenance department or service, as well as attaining proficiency in the course content.

building maintenance could then, be responsible for a class group which will contain one, the following ability/employability groupings:

Closely supervised institutional service.	Basic cleaning of floors, walls, glass, and outside areas.
Generally supervised industrial, commercial, educational complex service.	The above tasks, plus operation of simpler machines such as floor polishers, lawn mowers, snow throwers, and power sweepers.
Loosely supervised general service, requiring much independent responsibility.	All above, plus inventory, purchase orders, customer relations, and some supervision of other workers.
General service of a supervisory and administrative or totally independent responsibility.	All above, plus duties of the apartment or office building superintendent and of the assistant superintendent of a building complex.

It must be clearly understood that these terms and descriptions are broad generalizations i convenience in instructional organization, since *no individual can be exactly and irrevocably co* the primary duty of the teacher of building maintenance to evaluate pupil personnel tests and m light of his own industrial experience, to determine the *probable* employment capabilities of eac then to develop an individualized program of instruction calculated to bring the student to his achievement.

Successful completion of this course must then, be based on projected employability at the demonstrated level of ability, rather than on mastery of any fixed percentage of the total cours

After familiarizing himself with the contents of this syllabus, the teacher should begin or of study which, using the syllabus as a base, reflects the teaching conditions and employment si geographic area. The first task may be to reorganize the content into a tentative teaching prog first section of the syllabus is "Grounds Maintenance," but the teacher may prefer to begin inst "Custodial Services." Likewise, the syllabus places "Floors" as Unit I of "Custodial Services" of tasks and frequency of performance. The teacher can, if he desires, teach "Unit II — Wall an initial unit since these operations would be first in a job sequence where an entire room is to the teacher completes a tentative sequence of instruction his next task is to set limits of brea instruction in each unit of content, thus defining exactly what the student should know and what should possess as a result of the instruction. Considering the variety of student ability level levels inherent in building maintenance, the teacher of this course should find *performance obje* inestimable value.

In industry, the competent worker given an apprentice or new employee to instruct, judges b of the learner and the effectiveness of his instruction by whether or not the learner, on his ow perform the particular task.

v understood that these terms and descriptions are broad generalizations intended for tional organization, since *no individual can be exactly and irrevocably categorized*. It is e teacher of building maintenance to evaluate pupil personnel tests and measurements in trial experience, to determine the *probable* employment capabilities of each individual, and ividualized program of instruction calculated to bring the student to his highest level of

tion of this course must then, be based on projected employability at the individual's ability, rather than on mastery of any fixed percentage of the total course content.

ng himself with the contents of this syllabus, the teacher should begin organizing a course the syllabus as a base, reflects the teaching conditions and employment situation in his first task may be to reorganize the content into a tentative teaching progression. The yllabus is "Grounds Maintenance," but the teacher may prefer to begin instruction with Likewise, the syllabus places "Floors" as Unit I of "Custodial Services" due to simplicity of performance. The teacher can, if he desires, teach "Unit II — Wall and Ceiling" as the se operations would be first in a job sequence where an entire room is to be cleaned. When a tentative sequence of instruction his next task is to set limits of breadth and depth of it of content, thus defining exactly what the student should know and what new skills he sult of the instruction. Considering the variety of student ability levels and employment lding maintenance, the teacher of this course should find *performance objectives* to be of

competent worker given an apprentice or new employee to instruct, judges both the development effectiveness of his instruction by whether or not the learner, on his own, can actually task.

In teaching building maintenance, the industrially experienced instructor will instincti performance criteria in evaluating student progress. He should also use it as a means of sel successful teaching methods. The teacher should then, write performance objectives *before* de plans which state *how* he intends to teach. An added benefit of performance objectives is tha they not only clearly define the instruction but also constitute a test of the effectiveness While writing performance objectives for use by others requires some particular language abil one's own use is quite simple.

Performance objectives must always be stated in terms of the student, never in terms of Performance objectives must require *demonstration* of ability rather than an assumption that the, say that the student performs the skill, or describes the performance. Never do they st student "understands," or the student "appreciates." Performance objectives always will sta student can demonstrably do, 2) to what level of proficiency he must perform, and 3) under wh perform. For example, the unit of instruction may be the mixing of the cleaning agent for m state that "The student will understand how to mix liquid detergents and water in proper pro floors," is not a performance objective and is not of much use in determining instructional for evaluation. A performance objective for this task, written for three levels of ability

Average and Talented	Given a custodial chart which requires mopping of a vinyl fl given access to pertinent materials and equipment, the stude (or describe, orally or in writing) the proper container and prepare (or describe preparation of) the proper water/deterg correct sequence. No errors allowable.
Educable	Given the proper materials and equipment the student will mi and water in correct sequence, to within 10 percent of prope on a minimum of 9 out of 10 attempts.

Among th instructional methods following the objectives might be 1) opaque projectio name and instructions) of all detergents commonly used for the purpose, or overhead projecti

building maintenance, the industrially experienced instructor will instinctively use the same
ria in evaluating student progress. He should also use it as a means of selecting probably
ng methods. The teacher should then, write performance objectives *before* developing lesson
how he intends to teach. An added benefit of performance objectives is that, properly stated,
arly define the instruction but also constitute a test of the effectiveness of the instruction.
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quite simple.

objectives must always be stated in terms of the student, never in terms of the teacher.
tives must require *demonstration* of ability rather than an assumption that it exists, therefore,
student performs the skill, or describes the performance. Never do they state merely that the
nds," or the student "appreciates." Performance objectives always will state 1) what the
strably do, 2) to what level of proficiency he must perform, and 3) under what conditions he must
mple, the unit of instruction may be the mixing of the cleaning agent for mopping floors. To
tudent will understand how to mix liquid detergents and water in proper proportions for mopping
a performance objective and is not of much use in determining instructional methods or criteria
A performance objective for this task, written for three levels of ability might be:

e and
d

Given a custodial chart which requires mopping of a vinyl floor, and given access to pertinent materials and equipment, the student will select (or describe, orally or in writing) the proper container and detergent and prepare (or describe preparation of) the proper water/detergent mixture in correct sequence. No errors allowable.

le

Given the proper materials and equipment the student will mix detergent and water in correct sequence, to within 10 percent of proper proportion, on a minimum of 9 out of 10 attempts.

nstructional methods following the objectives might be 1) opaque projection of labels (brand
tions) of all detergents commonly used for the purpose, or overhead projection of facsimile trans-

parencies; 2) distribution of job instruction sheet; 3) teacher demonstration; 4) any combinatio
The column of suggestions, and the appended Resource Lists may be helpful here.

Evaluation of this instruction may be by observation of student performance during the cour
of student behavior during a scheduled performance test, and by evaluation of student answers to
A performance test requires only that the performance objective be reworded as a job instruction
oral quiz is constructed by rephrasing the objective as questions. The teacher who constructs h
on a basis of student performance, and phrases his desired teaching outcomes as performance obje
have, at the same time, constructed an outline for evaluating the success of the course and of t

All course objectives need not be stated in performance terms, however. Performance object
easily written for the psychomotor domain of skill development and the cognitive domain of occup
It is more difficult to write complete performance objectives in the affective domain areas of s
for evaluation of student attitudes remains a function of the teacher's judgement. When evaluat
"appreciation" the teacher should *think* in terms of performance objectives, but should not becom
precise writing.

Unit I —— FLOORS, of the CUSTODIAL SERVICES section, is offered as one example of how the
study should be developed from this syllabus.

UNIT I —— FLOORS	PERFORMANCE OBJECTIVES	
• Materials — Wood — Masonry . Concrete . Brick . Ceramic . Stone — Composition — Carpeting	*The student should be able to:* *Identify the material composing each of a representative group of teacher-supplied samples of standard floor materials.* *Describe the principal characteristics of each floor material.*	Motivatio problem h

ution of job instruction sheet; 3) teacher demonstration; 4) any combination of these.
ions, and the appended Resource Lists may be helpful here.

is instruction may be by observation of student performance during the course, by observation
uring a scheduled performance test, and by evaluation of student answers to questioning.
quires only that the performance objective be reworded as a job instruction, while a written/
ted by rephrasing the objective as questions. The teacher who constructs his course of study
performance, and phrases his desired teaching outcomes as performance objectives, will
e, constructed an outline for evaluating the success of the course and of the student.

tives need not be stated in performance terms, however. Performance objectives are most
e psychomotor domain of skill development and the cognitive domain of occupational know-how.
to write complete performance objectives in the affective domain areas of student attitudes,
dent attitudes remains a function of the teacher's judgement. When evaluating attitudes and
acher should *think* in terms of performance objectives, but should not become entangled in

S, of the CUSTODIAL SERVICES section, is offered as one example of how the teacher's course of
oped from this syllabus.

PERFORMANCE OBJECTIVES	NOTES
The student should be able to: *Identify the material composing each of a representative group of teacher-supplied samples of standard floor materials.* *Describe the principal characteristics of each floor material.*	Motivation is the crucial problem here.

◦ Maintenance — Frequency . Daily . Periodic — Processes . Cleaning . Stripping . Sealing . Waxing — Equipment . Vacuums . Scrubbers . Polishers	*The student should be able to:* *Demonstrate ability to perform duties in sequence outlined on custodial charts, performance meeting fiela standards of acceptability.* *Demonstrate ability to interpret chart information regarding procedures, equipment, and materials to be used.* *Demonstrate ability to operate floor maintenance equipment, conforming to field standards of safety and competency.*	Title job a mechanic" o rather than Use power e feasible.
◦ Repair — Staff work — Contracted service	*Recognize the limits of minor repairs to be performed by custodial staff.* *Demonstrate an ability to perform minor repairs to standard floor materials.*	Limits woul as well as particular

Having written a course of study organized in this manner, the teacher can more easily
of instruction —— both group and individual —— which will be more effective, evaluate the
and modify the instruction where effectiveness can be improved.

The student should be able to: *Demonstrate ability to perform duties in sequence outlined on custodial charts, performance meeting field standards of acceptability.*	Title job as "custodial mechanic" or similar term, rather than janitor. Use power equipment wherever feasible.
Demonstrate ability to interpret chart information regarding procedures, equipment, and materials to be used.	
Demonstrate ability to operate floor maintenance equipment, conforming to field standards of safety and competency.	
Recognize the limits of minor repairs to be performed by custodial staff.	Limits would be set by size as well as abilities of the particular staff.
Demonstrate an ability to perform minor repairs to standard floor materials.	

g written a course of study organized in this manner, the teacher can more easily plan units
tion —— both group and individual —— which will be more effective, evaluate the effectiveness,
the instruction where effectiveness can be improved.

CUSTODIAL SERVICES

Suggested Time: 120 Hours

UNIT I —— FLOORS

TEACHING SUGGESTIONS

- Materials
  - Wood
  - Masonry
    - Concrete
    - Brick
    - Ceramic
    - Stone
  - Composition
    - Linoleum
    - Vinyl
    - Vinyl-Asbestos
    - Asphalt
  - Carpeting
    - Wool
    - Synthetics

Use of actual floors or reasonably large mock-ups is more effective than small samples of materials.

- Maintenance
  - Frequency
    - Daily
    - Periodic
  - Processes
    - Cleaning
    - Stripping
    - Sealing
    - Waxing
  - Equipment
    - Vacuums
    - Scrubbers
    - Polishers

The custodial chart should be used wherever student ability allows.

Emphasize need to provide for safety of traffic through work area.

Standards of competency should vary both with the ability of the student and requirements of possible job openings.

The point where minor repairs become major differs with the size and nature of the maintenance staff. The teacher should set a realistic cut-off point.

- Repair
  - Staff work
  - Contract

UNIT II — WALL AND CEILING

- Surfaces
  - Wall
    - Ceramic
    - Glass
    - Vinyl
    - Melamine
    - Applied finish
      - Paints
      - Lacquers
      - Varnishes
      - Sealers
  - Ceiling
    - Acoustic tile
      - Vegetable fiber
      - Asbestos
    - Glass fiber panel
    - Applied finish
  - Maintenance
    - Custodial chart

The student should be able to distinguis
applied surfaces and those which are pa
structure.

Emphasize the necessity of removing, pr
reconditioning floors, window sills, ra
similar areas.

Instruction in cleaning exterior glass
floor level requires particular teacher
safety and supervision.

Instruction should include the damage w
from use of improper materials or metho
materials, as well as practice in use o
and methods.

Proper erection of scaffolding and use
of extreme importance.

UNIT III — WINDOWS

- Design
  - Double hung
  - Casement
  - Vent
    - Awning
    - Hopper
  - Sliding

- Materials
  - Wood
  - Aluminum

It is not necessary that all students b
identify window types by name, but if o
of safety, all students must:
*Demonstrate ability to identify movabl
fixed lights.*
*Demonstrate ability to unlatch, open,
relatch each type of movable sash.*

Removal, handling, storage, and reinsta
removable double glazing must be taught

— WALL AND CEILING

urfaces
Vall
  Ceramic
  Glass
  Vinyl
  Melamine
  Applied finish
    Paints
    Lacquers
    Varnishes
    Sealers
Ceiling
  Acoustic tile
    Vegetable fiber
    Asbestos
  Glass fiber panel
  Applied finish
Maintenance
  Custodial chart

The student should be able to distinguish between applied surfaces and those which are part of the structure.

Emphasize the necessity of removing, protecting, or reconditioning floors, window sills, radiators, and similar areas.

Instruction in cleaning exterior glass above ground-floor level requires particular teacher attention to safety and supervision.

Instruction should include the damage which can result from use of improper materials or methods on particular materials, as well as practice in use of proper material and methods.

Proper erection of scaffolding and use of ladders is of extreme importance.

— WINDOWS

esign
Double hung
Casement
Vent
  Awning
  Hopper
Sliding

aterials
Wood
Aluminum

It is not necessary that all students be able to identify window types by name, but if only for purposes of safety, all students must:
Demonstrate ability to identify movable sash and fixed lights.
Demonstrate ability to unlatch, open, close, and relatch each type of movable sash.

Removal, handling, storage, and reinstallation of removable double glazing must be taught.

- Glass
  . Strength
  . Style
    Transparent
    Translucent
    Tinted
    Ribbed

The student should know the system o
glass and the types of safety glass.
a broad understanding of the charact
standard uses of each.

- Mechanism
  - Operator
    . Manual
    . Rotary
  - Latch
    . Cam
    . Bolt

- RDG

- Weatherstripping

- Maintenance
  - Process
    . Cleaning
    . Lubricating
  - Frequency
    . Daily
    . Periodic

Emphasize the importance of keeping
and slots clean, free of debris, and
lubricated.

UNIT IV —— SANITARY FACILITIES

- Major fixtures
  - Service
    . Lavatories
    . Showers
    . Urinals and closets
    . Mirrors

Several types, in several materials,
able for student inspection and prac
of graphic representations is allowa

- Glass
  - Strength
  - Style
    - Transparent
    - Translucent
    - Tinted
    - Ribbed

The student should know the system of "strengths" of glass and the types of safety glass. He should have a broad understanding of the characteristics and standard uses of each.

- Mechanism
  - Operator
    - Manual
    - Rotary
  - Latch
    - Cam
    - Bolt

- RDG

- Weatherstripping

- Maintenance
  - Process
    - Cleaning
    - Lubricating
  - Frequency
    - Daily
    - Periodic

Emphasize the importance of keeping mechanisms, tracks, and slots clean, free of debris, and where required, lubricated.

IV — SANITARY FACILITIES

- Major fixtures
  - Service
    - Lavatories
    - Showers
    - Urinals and closets
    - Mirrors

Several types, in several materials, should be available for student inspection and practice, but some use of graphic representations is allowable.

- Materials
  - . Vitreous china
  - . Porcelained
    - Steel
    - Cast iron
  - . Stainless steel
  - . Bright plated
  - . Glass

- Dispensers
- Paper
  - . Towels
  - . Tissue
- Warm air
- Soap
- Disinfectants
- Deodorizers
- Sanitary napkins

- Maintenance
- Cleaning
  - . Daily
  - . Periodic
- Resupplying

Job status can be a real problem in t
teacher should give much thought to m
plishing motivation. A good starting
to remind that their mothers perform
at home and are not considered "degra

Use of the custodial chart is very vi

UNIT V —— FURNISHINGS

- Service
- Office
  - . Desks
  - . Chairs
  - . Tables
  - . Cabinets
    - File
    - Supply

The habit of continual use of the cu
be developed.

The student should also acquire judg
furnishings are moved to facilitate
and which are moved only for periodi
redecorating; which should be moved
should require equipment; and which
should be selected for moving partic

aterials
Vitreous china
Porcelained
Steel
Cast iron
Stainless steel
Bright plated
Glass

spensers
aper
Towels
Tissue
arm air
oap
isinfectants
eodorizers
anitary napkins

intenance
leaning
Daily
Periodic
esupplying

— FURNISHINGS

rvice
ffice
Desks
Chairs
Tables
Cabinets
File
Supply

Job status can be a real problem in this area. The teacher should give much thought to means of accomplishing motivation. A good starting point may be to remind that their mothers perform these services at home and are not considered "degraded."

Use of the custodial chart is very valuable here.

The habit of continual use of the custodial chart must be developed.

The student should also acquire judgment as to which furnishings are moved to facilitate routine cleaning, and which are moved only for periodic cleaning or redecorating; which should be moved manually, and which should require equipment; and which piece of equipment should be selected for moving particular furnishings.

- Lounge
  - Couches
  - Chairs
  - Tables
  - Book racks

- General
  - Lamps
  - Folding partitions
  - Venetian blinds
  - Curtains
  - Draperies
  - Chalk boards
  - Bulletin boards
  - Coat racks

- Maintenance
  - Moving
  - Storing
  - Cleaning
  - Repairing

The course equipment should include a sample of carts, dollies, and handtruc

It is extremely important that all stu the "body mechanics" of proper lifting carrying.

UNIT VI —— SPECIAL AREAS

- Service
  - Auditorium
  - Gymnasium
  - Stadium
  - Cafeteria
  - Athletic field
  - Conference room

The student should be aware of the pa involved in maintenance of each area, procedures to be used. Field trips t before, during, and immediately after valuable.

A good method is to effect a cooperat with school custodial staffs which wi live work at school facilities.

Lounge
- Couches
- Chairs
- Tables
- Book racks

General
- Lamps
- Folding partitions
- Venetian blinds
- Curtains
- Draperies
- Chalk boards
- Bulletin boards
- Coat racks

Maintenance
- Moving
- Storing
- Cleaning
- Repairing

The course equipment should include a representative sample of carts, dollies, and handtrucks.

It is extremely important that all students be taught the "body mechanics" of proper lifting, pushing, and carrying.

VI —— SPECIAL AREAS

Service
- Auditorium
- Gymnasium
- Stadium
- Cafeteria
- Athletic field
- Conference room

The student should be aware of the particular problems involved in maintenance of each area, as well as the procedures to be used. Field trips to these areas before, during, and immediately after use should be valuable.

A good method is to effect a cooperative arrangement with school custodial staffs which will allow students live work at school facilities.

- Procedures
  - Preparatory
    - Cleaning
    - Setting up
  - Maintaining set up
  - Follow up
    - Removing temporaries
    - Storing temporaries
    - Cleaning

UNIT VII — SUPPLIES AND EQUIPMENT

- Equipment
  - Tools
    - Hand
    - Power
  - Equipment maintenance
    - Cleaning
    - Lubricating
    - Repairing
  - Applicators
    - Brushes
    - Cloths
    - Sponges
  - Storage units

The student must, of course, know prop
and equipment. He should be able to s
nomer items from stock, for the job to
teacher should emphasize the effects o
waste and abuse of tools, equipment, a
conversely, of working with worn out,
improper materials.

The student's apparent ability should
tent of equipment maintenance knowledg
which he should be accountable.

- Supplies
  - Cleaning agents
    - Caustic
    - Abrasive
    - Detergent
    - Neutral
  - Waxes and polishes
  - Disinfectants
  - Deodorant
  - Dispenser supplies
  - Gasoline, oil, and grease

The student should be conditioned to c
label of each new container, and follo
exactly.

Not only should the student be aware o
dently dangerous materials, he should
harmful and hazardous substances can
created by mixing cleaning agents.

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eparatory
Cleaning
Setting up
intaining set up
llow up
Removing temporaries
Storing temporaries
Cleaning

—— SUPPLIES AND EQUIPMENT

ipment
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Lubricating
Repairing
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Brushes
Cloths
Sponges
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leaning agents
Caustic
Abrasive
Detergent
Neutral
ams and polishes
isinfectants
odorant
ispenser supplies
asoline, oil, and
grease

The student must, of course, know proper names of tools and equipment. He should be able to select the commoner items from stock, for the job to be done. The teacher should emphasize the effects on profits of waste and abuse of tools, equipment, and supplies, and conversely, of working with worn out, defective, or improper materials.

The student's apparent ability should indicate the extent of equipment maintenance knowledge and skills for which he should be accountable.

The student should be conditioned to carefully read the label of each new container, and follow directions exactly.

Not only should the student be aware of the more evidently dangerous materials, he should also know that harmful and hazardous substances can sometimes be created by mixing cleaning agents.

UNIT VIII — SAFETY

- Property damage
  - Utility lines
    - Gas
    - Electricity
    - Water
  - Storage
    - Combustibles
    - Spoilables
  - Equipment operation
    - Glass breakage
    - Structure damage
    - Landscape damage
  - Fires
    - Prevention
    - Classification
    - Extinguishing

Safety — both personal and public — and property protection should be an inherent part of all instruction. It is separately categorized here only for convenience of presentation.

The student should be taught what he must *not* do, as well as proper procedures, and should understand *why* he should or must not.

It is especially important that building maintenance personnel knows the classification of fires, the proper extinguishers for each, and the dangers of using the wrong type.

- Personal injury
  - Cuts and punctures
    - Equipment-caused
    - Materials-caused
      - Glass
      - Metals
      - Plastics
  - Burns
    - Thermal
    - Chemical
    - Electrical
  - Shock
    - Electrical
      - Equipment
      - Supply lines
    - Impact
      - Personal falls
      - Falling objects

The student must be made aware of the injury potential of common tools, equipment, and materials.

- Asphyxia
  - . Smoke
  - . Gases
  - . Oxygen deficiency
- Emergency procedures
  - . Securing help
  - . Preventing further injury
  - . First aid
    - Limits
    - Procedures

It is desirable that the student receive instruction in basic first-aid. It is mandatory that he receive instruction in emergency procedures.

UNIT IX —— HUMAN RELATIONS

- Interstaff
  - Fellow workers
  - Superiors
  - Subordinates
- Nonstaff
  - Visitors
  - Occupants

The teacher should emphasize the importance of tolerance and courtesy; that far more employees are discharged because they antagonize other people, than because they do not perform the work.

GROUNDS MAINTENANCE

Suggested Time: 50 Hours

UNIT I —— ROADS, WALKS, PARKING AREAS

TEACHING SUGGESTIONS

- Cleaning
  - Sweeping
    - Hand
    - Power
  - Washing
  - Sealing

The student should be capable of selecting sweeping equipment for a given job, as wel of using it.

The teacher should emphasize *why* these sur as well as how to do so.

- Weather problems
  - Snow removal
  - Ice removal
  - Drainage

The student should be acquainted with the problems which result from improper mainte flooding and runoff from plowed-in drains disruptions due to covered signs and marki

- Traffic flow
  - Signs
  - Markings
  - Lighting
  - Barricades

Instruction should include testing and rep photoelectric and timed lighting controls.

UNIT II —— LANDSCAPE

- Type
  - Lawns
  - Shrubbery
  - Flowers
  - Trees

The student should be able to demonstrate selected means, an ability to classify any as tree or shrub; grass, flower, or weed.

GROUNDS MAINTENANCE

Suggested Time: 60 Hours

I —— ROADS, WALKS, PARKING AREAS	TEACHING SUGGESTIONS
Cleaning Sweeping . Hand . Power Washing Sealing	The student should be capable of selecting the proper sweeping equipment for a given job, as well as capable of using it. The teacher should emphasize *why* these surfaces are sealed, as well as how to do so.
Weather problems Snow removal Ice removal Drainage	The student should be acquainted with the less evident problems which result from improper maintenance, such as flooding and runoff from plowed-in drains and traffic disruptions due to covered signs and markings.
Traffic flow Signs Markings Lighting Barricades	Instruction should include testing and replacement of photoelectric and timed lighting controls.
II —— LANDSCAPE	
Type Lawns Shrubbery Flowers Trees	*The student should be able to demonstrate by any teacher selected means, an ability to classify any common sample as tree or shrub; grass, flower, or weed.*

- Cultivation
  - Watering
  - Fertilizing
  - Mulching
  - Mowing and pruning
  - Debris removing
    - Leaves and cuttings
    - Litter

The ability to use a procedural chart an manuals to determine maintenance of exis should be developed.

- Protection
  - Insecticides
  - Fungicides
  - Herbicides
  - Seasonal preparation

Emphasize the hazardous nature of all in fungicides, and herbicides, and of some the need to obey instructions exactly.

UNIT III — EQUIPMENT

- Snow blowers
  - Single stage
  - Two stage

The operating of power equipment can be vating factor.

- Lawn mowers
  - Type
    - Rotary
    - Reel
  - Drive
    - Manual
    - Self-propelled
      - Walking
      - Riding

While power equipment is generally more hand tools, its use in the field is cons *All* students should be instructed in the functioning, the potential hazards and and practical field operation of all cu equipment. All students should be provi ity to demonstrate competence under clo vision. The teacher will, of course, e ment in regard to loosely supervised op particular students.

- Lawn cleaners
  - Type
    - Sweeper
    - Vacuum
  - Drive
    - Manual
    - Trailer
    - Self-propelled

ltivation
atering
ertilizing
ulching
owing and pruning
ebris removing
Leaves and cuttings
Litter

The ability to use a procedural chart and horticultural manuals to determine maintenance of existing landscape should be developed.

otection
nsecticides
ungicides
erbicides
easonal preparation

Emphasize the hazardous nature of all insecticides, fungicides, and herbicides, and of some fertilizers, and the need to obey instructions exactly.

— EQUIPMENT

ow blowers
ingle stage
wo stage

wn mowers
ype
Rotary
Reel
rive
Manual
Self-propelled
Walking
Riding

The operating of power equipment can be a powerful motivating factor.

While power equipment is generally more dangerous than hand tools, its use in the field is constantly increasing. *All* students should be instructed in the functions and functioning, the potential hazards and safe procedure, and practical field operation of all currently used power equipment. All students should be provided the opportunity to demonstrate competence under close teacher supervision. The teacher will, of course, exercise his judgment in regard to loosely supervised operation by particular students.

wn cleaners
ype
Sweeper
Vacuum
rive
Manual
Trailer
Self-propelled

- Function
  - Operation
  - Maintenance

- Watering systems
  - Underground
  - Self-propelled
  - Manually placed

- Feeding and protecting systems
  - Liquid sprayers
  - Power spreaders
  - Granule spreaders

Competence in routine cleaning and lubri
directed by manufacturers' literature, s
prerequisite to the student being listed
who the teacher will assign to operating

The maintenance, adjustment, and minor r
valves, timers, lines, and other parts o
should be taught, as well as the safe an

nction
peration
aintenance

tering systems
nderground
elf-propelled
anually placed

eding and protecting systems
iquid sprayers
ower spreaders
ranule spreaders

Competence in routine cleaning and lubricating, as directed by manufacturers' literature, should be a prerequisite to the student being listed with those who the teacher will assign to operating power equipment.

The maintenance, adjustment, and minor repair of valves, timers, lines, and other parts of these systems should be taught, as well as the safe and efficient use.

REDECORATING

Suggested Time: 55 Hours

UNIT — SURFACE PREPARATION	TEACHING SUGGESTIONS
• Cleaning	The student must be made aware of the cr
– Washing	importance of properly preparing the sur
. Detergents	refinished.
. Solvents	
– Stripping	Emphasize that some surfaces need only b
. Abrasives	deposits, some may require roughening or
Hand	some may require removal of previously a
Power	
. Heat	The student should be instructed in the
. Chemicals	stripping materials and equipment.
. Scrapers	
• Patching	The student should be assisted in develo
– Surface	knowledge of the physical properties of
. Masonry	materials and respective patching materi
. Wood	
. Metal	*The student should be able to demonstrat*
. Plastic	*select materials, equipment, and procedu*
– Materials	*form the operations necessary to patch t*
. Putty	*of quality, any teacher-designated surfa*
. Wood doughs	
. Spackle	Dry wall joint system application must b
. Dry wall cement	Whether it is considered the domain of t
. Mortar	mason, or the carpenter differs with loc
. Epoxy fillers	nonunion status of the workers.
. Stick shellac	
• Smoothing	
– Tools	Instruction should include an explanatio
. Planes	tools function.
Hand	
Power	The student should be able to perform ro
. Rasps and files	of tools, including sharpening of those
. Scrapers	or honed in the field.
. Surforms	

REDECORATING

Suggested Time: 55 Hours

— SURFACE PREPARATION	TEACHING SUGGESTIONS
Cleaning - Washing . Detergents . Solvents - Stripping . Abrasives Hand Power . Heat . Chemicals . Scrapers	The student must be made aware of the critical importance of properly preparing the surface to be refinished. Emphasize that some surfaces need only be washed clean of deposits, some may require roughening or smoothing, and some may require removal of previously applied finishes. The student should be instructed in the safe use of stripping materials and equipment.
Patching - Surface . Masonry . Wood . Metal . Plastic - Materials . Putty . Wood doughs . Spackle . Dry wall cement . Mortar . Epoxy fillers . Stick shellac	The student should be assisted in developing a general knowledge of the physical properties of common building materials and respective patching materials. *The student should be able to demonstrate an ability to select materials, equipment, and procedure, and to perform the operations necessary to patch to field standards of quality, any teacher-designated surface.* Dry wall joint system application must be taught. Whether it is considered the domain of the painter, the mason, or the carpenter differs with locality and union/nonunion status of the workers.
Smoothing - Tools . Planes Hand Power . Rasps and files . Scrapers . Surforms	Instruction should include an explanation of how the tools function. The student should be able to perform routine maintenance of tools, including sharpening of those commonly ground or honed in the field.

- Sanders
  - Belt
  - Disc
  - Orbital
  - Reciprocating
- Abrasives
  - Type
  - Shape
  - Grade

Emphasize that a good finish cannot be at
poorly prepared surface.

The student should know the system of ide
composition, grit size, backing, and othe
of coated abrasives, well enough to prope
stock for any particular smoothing operat

The student should know the strengths, we
probable side effects of the different s
as being proficient in their use.

- Staining
- Types
  - Oil
  - Water
  - Spirit
- Properties

UNIT II —— FINISHES

- Types
- Clear
  - Varnish
  - Shellac
  - Lacquer
  - Synthetic resins
  - Sealers
- Paint
  - Base
    - Oil
    - Water emulsion
  - Use
    - Primer
    - Finish coat
  - Surface finish
    - Flat
    - Semigloss
    - Gloss
    - Textured

Instruction should include the strengths
of the various finishes, use of solvents
and conditions during and after applicat
damage the finish.

It is important that the student be able
finish as either oil-base or water-base,
mation provided on the label.

The student should be instructed in the
or undesirability, of certain characteri
resistance, easy washability, high refle
govern selection for particular uses.

- Sanders
  - Belt
  - Disc
  - Orbital
  - Reciprocating
- Abrasives
  - Type
  - Shape
  - Grade

Emphasize that a good finish cannot be attained on a poorly prepared surface.

The student should know the system of identifying grit composition, grit size, backing, and other characteristics of coated abrasives, well enough to properly select from stock for any particular smoothing operations.

- Staining
- Types
  - Oil
  - Water
  - Spirit
- Properties

The student should know the strengths, weaknesses, and probable side effects of the different stains, as well as being proficient in their use.

II —— FINISHES

- Types
- Clear
  - Varnish
  - Shellac
  - Lacquer
  - Synthetic resins
  - Sealers
- Paint
  - Base
    - Oil
    - Water emulsion
  - Use
    - Primer
    - Finish coat
  - Surface finish
    - Flat
    - Semigloss
    - Gloss
    - Textured

Instruction should include the strengths and weaknesses of the various finishes, use of solvents and thinners, and conditions during and after application which might damage the finish.

It is important that the student be able to identify a finish as either oil-base or water-base, through information provided on the label.

The student should be instructed in the desirability, or undesirability, of certain characteristics —— soil resistance, easy washability, high reflectivity —— which govern selection for particular uses.

- Service
  - Interior
  - Exterior

Emphasize that while the use of interior is merely uneconomical, the use of lead-b paints indoors can be injurious to health

- Solvents
  - Mineral spirits
  - Turpentine
  - Lacquer thinner
  - Alcohol
  - Other

The student should be aware of the impor the correct solvent.

Instruction should include such possible as destruction of particular plastics an of vapors.

Emphasize skin and eye protection as wel inhalation and ingestion.

- Application
  - Brush
    - Types
    - Sizes
    - Materials
  - Roller
    - Types
      - Pan
      - Pressure
    - Materials
      - Mohair
      - Lamb's wool
  - Spray
    - Suction
    - Pressure

Strive to develop students' judgment in type and size, and bristle material. Th know when it is more efficient to use a brush which is on hand, than to delay to the "correct" brush.

Emphasize the importance of using the ty is required for the type of paint to be

Instruction should include a comparison advantages and disadvantages of the two

The student should be able to demonstrat clean brushes, rollers, and spray equipm standards of acceptability.

UNIT III ---- WALL COVERINGS

- Roll materials
  - Paper
  - Fabric
  - Plastic

The student should be able to identify t samples as being either roll or sheet, a materials from which each is made.

Service
- Interior
- Exterior

Emphasize that while the use of interior paints outdoors is merely uneconomical, the use of lead-base exterior paints indoors can be injurious to health.

Solvents
- Mineral spirits
- Turpentine
- Lacquer thinner
- Alcohol
- Other

The student should be aware of the importance of using the correct solvent.

Instruction should include such possible side effects as destruction of particular plastics and spark ignition of vapors.

Emphasize skin and eye protection as well as hazards of inhalation and ingestion.

Application
- Brush
  - Types
  - Sizes
  - Materials
- Roller
  - Types
    - Pan
    - Pressure
  - Materials
    - Mohair
    - Lamb's wool
- Spray
  - Suction
  - Pressure

Strive to develop students' judgment in selecting brush type and size, and bristle material. The student should know when it is more efficient to use a slighty "wrong" brush which is on hand, than to delay to obtain exactly the "correct" brush.

Emphasize the importance of using the type cover which is required for the type of paint to be applied.

Instruction should include a comparison of the relative advantages and disadvantages of the two spray systems.

The student should be able to demonstrate an ability to clean brushes, rollers, and spray equipment, to field standards of acceptability.

III —— WALL COVERINGS

Roll materials
- Paper
- Fabric
- Plastic

The student should be able to identify teacher-supplied samples as being either roll or sheet, and to state the materials from which each is made.

- Sheet materials
  - Melamine laminates
  - Vinyls
- Sizes and sealers
- Adhesives
  - Pastes
  - Glues
  - Contact cements
- Equipment
  - Measuring
  - Cutting
  - Preparing
  - Applying

Instruction should include *why* sizes and s
used, and *how* they work.

The strengths, and weaknesses, as well as
uses, of the various adhesives should be i
instruction.

The student should develop ability to sele
as well as to use various pieces of equipm

The teacher should be prepared to conduct
remedial instruction in measurement and co

Emphasize the supreme importance of straig
plumb or level joints, and well-matched pa

UNIT IV —— SAFETY

- Materials
  - Storage
  - Fire
    - Type
    - Extinguishers

The student should have a general understa
combustion is, and how it takes place. He
that while most common materials require o
atmosphere in order to burn, many supply t
and will, therefore, be difficult to extin
water.

*The student will be able to list the commo
materials in each type of fire. He will b
tify teacher-selected extinguishers as Typ
Type C, or Type B/C, and explain why each
must not be, used on teacher-specified bur

- Sheet materials
  - Melamine laminates
  - Vinyls
- Sizes and sealers

Instruction should include *why* sizes and sealers must be used, and *how* they work.

- Adhesives
  - Pastes
  - Glues
  - Contact cements

The strengths, and weaknesses, as well as the appropriate uses, of the various adhesives should be included in instruction.

- Equipment
  - Measuring
  - Cutting
  - Preparing
  - Applying

The student should develop ability to select and maintain, as well as to use various pieces of equipment.

The teacher should be prepared to conduct review or remedial instruction in measurement and computation.

Emphasize the supreme importance of straight, tight, plumb or level joints, and well-matched patterns.

T IV —— SAFETY

- Materials
  - Storage
  - Fire
    - Type
    - Extinguishers

The student should have a general understanding of what combustion is, and how it takes place. He should know that while most common materials require oxygen from the atmosphere in order to burn, many supply their own oxygen and will, therefore, be difficult to extinguish with water.

The student will be able to list the common combustible materials in each type of fire. He will be able to identify teacher-selected extinguishers as Type A, Type B, Type C, or Type B/C, and explain why each must be, or must not be, used on teacher-specified burning materials.

- Equipment
  - Tools
    - Electrical hazards
    - Cuts
  - Ladders and scaffolds

- Personal
  - Eye and skin
  - Ingestion
  - Inhalation

- Procedures
  - First-Aid
  - Report forms
  - Workmen's Compensation
  - Hospitalization insurance

Standard safety procedures must not only be taught, but continuously enforced. The teacher must himself obey safety regulations and observe safety procedures.

The student should be able to identify common materials as being conductors or insulators.

Instruction should include the most basic of First-Aid procedures, completion of accident report forms, and general information on coverages, benefits, and applications for benefits of Compensation and hospital insurance plans.

CARPENTRY

Suggested Time: 180 Hours

UNIT I —— TOOL UTILIZATION

TEACHING SUGGESTIONS

- Type
  - Hand
  - Power
    - Portable
    - Stationary
- Function
  - Cutting
  - Boring
  - Smoothing
  - Driving
  - Holding
  - Turning
  - Layout
- Use
  - Woods
  - Metals
    - Ferric
    - Nonferric
  - Plastics
  - Other

Students should become familiar with the c
tools through use rather than through memo
exercises. By this means he will also ass
ticular tools with specific work tasks.

Use of the common power tools should be re
entry-level proficiency with hand tools ha

The teacher must unvaryingly enforce all s
cedures regarding tools, and unfailingly o
himself. It is suggested that dated, writ
safe, proper procedures be administered be
are allowed to use power tools, and that t
as "passing" be kept on file.

Students should be able to maintain in pro
of readiness, those tools customarily shar
and adjusted by the craftsman, on the jobs

UNIT II —— MATERIALS UTILIZATION

- Framing
  - DIM lumber
  - Laminated parts

The student must know the system of sizin
and be aware of the difference between no
actual dimensions. He should have a gene
the chief species of wood used, and their

The student should be instructed in *why* l
provide superior performance.

CARPENTRY

Suggested Time: 180 Hours

I —— TOOL UTILIZATION

TEACHING SUGGESTIONS

Type
- Hand
- Power
  - Portable
  - Stationary

Function
- Cutting
- Boring
- Smoothing
- Driving
- Holding
- Turning
- Layout

Use
- Woods
- Metals
  - Ferric
  - Nonferric
- Plastics
- Other

Students should become familiar with the common hand tools through use rather than through memorization exercises. By this means he will also associate particular tools with specific work tasks.

Use of the common power tools should be reserved until entry-level proficiency with hand tools has been attained.

The teacher must unvaryingly enforce all safety procedures regarding tools, and unfailingly observe them himself. It is suggested that dated, written tests of safe, proper procedures be administered before students are allowed to use power tools, and that those graded as "passing" be kept on file.

Students should be able to maintain in proper condition of readiness, those tools customarily sharpened, cleaned, and adjusted by the craftsman, on the jobsite.

II —— MATERIALS UTILIZATION

Framing
- DIM lumber
- Laminated parts

The student must know the system of sizing DIM lumber and be aware of the difference between nominal and actual dimensions. He should have a general knowledge of the chief species of wood used, and their properties.

The student should be instructed in *why* laminated members provide superior performance.

- Insulation
  - Rigid
  - Flexible
  - Granular

The student should be able to demonstrate
standing of the theory of heat transfer
examples of conduction, convection, and

The student should be able to identify by
preferred use, samples of such common ma
fiberboards, expanded mica, aluminum foi
and asbestos fibers.

- Sheathing
  - Composition
  - Plywood
  - Board

The student must know the systems of size
sheathing; both panels and lineal stock.
should include comparison of the strengt
nesses of the common materials.

- Roofing
  - Strip shingle
  - Wood shingle
  - Roll
  - SIS
  - Hot built-up
  - Slate
  - Tile

The student should be able to identify by
examples, photos or valid sketches, or m
samples of common roofing.

- Window and door units
  - Rough openings
  - Frame/jamb
  - Doors
    - Panel/flush
    - Hollow core/solid
  - Windows
    - Double hung
    - Casement
    - Vent
    - Gliding
  - Glass

Instruct the student on the strengths, w
method of operation of the various windo
units. The student should be aware of t
of, and usefulness of, the mill book.

The student should be able to demonstrat
teacher-selected means, an ability to id
name and describe the characteristics of
window and door units.

Instruction should include the "strength
glass.

- Exterior finish
  - Shakes
  - Wood siding
  - Aluminum siding
  - Composition

The student should be able to identify t
existing interior and exterior surfaces,
sight, by "rapping," or by other nondest

Insulation
- Rigid
- Flexible
- Granular

The student should be able to demonstrate an understanding of the theory of heat transfer by giving examples of conduction, convection, and radiation.

The student should be able to identify by name and preferred use, samples of such common materials as fiberboards, expanded mica, aluminum foil, and glass and asbestos fibers.

Sheathing
- Composition
- Plywood
- Board

The student must know the systems of sizes used for sheathing; both panels and lineal stock. Instruction should include comparison of the strengths and weaknesses of the common materials.

Roofing
- Strip shingle
- Wood shingle
- Roll
- SIS
- Hot built-up
- Slate
- Tile

The student should be able to identify by name "live" examples, photos or valid sketches, or materials samples of common roofing.

Window and door units
- Rough openings
- Frame/jamb
- Doors
  . Panel/flush
  . Hollow core/solid
- Windows
  . Double hung
  . Casement
  . Vent
  . Gliding
- Glass

Instruct the student on the strengths, weaknesses, and method of operation of the various window and door units. The student should be aware of the existence of, and usefulness of, the mill book.

The student should be able to demonstrate by any teacher-selected means, an ability to identify by name and describe the characteristics of the common window and door units.

Instruction should include the "strength" system for glass.

Exterior finish
- Shakes
- Wood siding
- Aluminum siding
- Composition

The student should be able to identify the nature of existing interior and exterior surfaces, either by sight, by "rapping," or by other nondestructive test.

- Interior finish
  - Gypsum board
  - Plypanel
  - Phenolic panels
  - Millwork
    - Base
    - Casing
    - Mouldings

Instruction should include the strengths an
of the various materials, and the preferred
use.

- Hardware
  - Locks and latches
    - Surface
    - Inset
  - Hinges
    - Butt
    - Double acting
    - Cabinet
  - Door closers
    - Hydraulic
    - Pneumatic
  - Window mechanisms
    - Sash balances
    - Crank operators
  - Miscellaneous
    - Door and drawer pulls
    - Push and kick plates
    - Door stops
    - Panic bars

Students should be able to classify the com
hardware, and describe its operation. They
be required to repair the cylinder of pin-t
or internal parts of hydraulic door closers

- Supplies
  - Nails
    - Common
    - Finishing
    - Other
  - Screws
    - Head shape and type
    - Material

It is necessary that students be able to id
sight the length, gauge, and type of nails
The system should be learned by using the i
rather than by rote.

Interior finish Gypsum board Plypanel Phenolic panels Millwork . Base . Casing . Mouldings	Instruction should include the strengths and weaknesses of the various materials, and the preferred points of use.
Hardware Locks and latches . Surface . Inset Hinges . Butt . Double acting . Cabinet Door closers . Hydraulic . Pneumatic Window mechanisms . Sash balances . Crank operators Miscellaneous . Door and drawer pulls . Push and kick plates . Door stops . Panic bars	Students should be able to classify the common building hardware, and describe its operation. They should not be required to repair the cylinder of pin-tumbler locks or internal parts of hydraulic door closers.
Supplies Nails . Common . Finishing . Other Screws . Head shape and type . Material	It is necessary that students be able to identify by sight the length, gauge, and type of nails and screws. The system should be learned by using the items, rather than by rote.

- Adhesives
  - . Epoxies
  - . Resorcinol resin
  - . Polyvinyl resin
  - . Contact cements
  - . Organic glues

The student should be made aware of the ma
and general purpose adhesives commonly use
construction and maintenance, and of the p
attendant on the strengths and weaknesses
Emphasize that the label should be read an
before the container is opened.

UNIT III —— MAINTENANCE AND REPAIR

- Exterior
  - Ramps and docks
  - Stairs and railings
  - Roofing and flashing
  - Gutters and downspouts
  - Vents and louvers
  - Awnings
  - Doors and windows
    - . Glass
    - . Screening
    - . Hardware
  - Surface finishes and trim
  - Stadium seating

There are no valid guidelines regarding wh
particular job becomes contract size inste
maintenance staff work —— size and compet
staff, economic considerations, union cont
other local factors having affect. Each t
decide how "big" a job must be to remove
"normal" maintenance staff work. This doe
clude instruction in depth of those studen
of benefitting therefrom, but minimum comp
required for employment should continue to
criteria of student success.

- Interior
  - Walls and ceilings
  - Floors
  - Stairways
  - Storage units
    - . Cabinets
    - . Shelves
    - . Racks
  - Doors and windows
  - Movable partitions
  - Seating
    - . Auditorium
    - . Gymnasium
  - Furniture

- Adhesives
  - Epoxies
  - Resorcinol resin
  - Polyvinyl resin
  - Contact cements
  - Organic glues

The student should be made aware of the many special and general purpose adhesives commonly used in building construction and maintenance, and of the preferred uses attendant on the strengths and weaknesses of each. Emphasize that the label should be read and understood before the container is opened.

III —— MAINTENANCE AND REPAIR

Exterior
- Ramps and docks
- Stairs and railings
- Roofing and flashing
- Gutters and downspouts
- Vents and louvers
- Awnings
- Doors and windows
  - Glass
  - Screening
  - Hardware
- Surface finishes and trim
- Stadium seating

There are no valid guidelines regarding where a particular job becomes contract size instead of maintenance staff work —— size and competency of staff, economic considerations, union contracts, and other local factors having affect. Each teacher must decide how "big" a job must be to remove it from "normal" maintenance staff work. This does not preclude instruction in depth of those students capable of benefitting therefrom, but minimum competencies required for employment should continue to be the criteria of student success.

Interior
- Walls and ceilings
- Floors
- Stairways
- Storage units
  - Cabinets
  - Shelves
  - Racks
- Doors and windows
- Movable partitions
- Seating
  - Auditorium
  - Gymnasium
- Furniture

UNIT IV —— ADDITIONS AND NEW WORK

- Framing
  - To existing structure
  - Freestanding

Emphasize the importance of blending addi
existing structures, appearance wise.

- Blending-in
  - Roofing
  - Walls
  - Floors
  - Trim

Joints of new-to-old should be "staggered
leaving an obvious outline.

- Form building
  - Walks
  - Steps
  - Slabs

Emphasize the importance of accurate work
building, even though the structures are

V —— ADDITIONS AND NEW WORK

Framing
- To existing structure
- Freestanding

Emphasize the importance of blending additions to existing structures, appearance wise.

Blending-in
- Roofing
- Walls
- Floors
- Trim

Joints of new-to-old should be "staggered" to avoid leaving an obvious outline.

Form building
- Walks
- Steps
- Slabs

Emphasize the importance of accurate work in form building, even though the structures are temporary.

MASONRY

Suggested Time: 60 hours

UNIT I — CONCRETE	TEACHING SUGGESTIONS
• Composition – Cement – Aggregate – Water – Admixtures	The student should know that different and aggregates are available, as well a proportions, to obtain concrete whose q for specific uses. He should understan specifications should be carefully foll not necessary that he memorize types, p designations of components.
	Emphasize proper methods of storing and
• Preparation – Proportions – Equipment . Hand mix . Power mix – Procedure	*The student should be able to combine i* *both by hand and by machine, the specif* *a stated amount of concrete, the mix be* *elatory for any teacher-selected use.* Emphasize the importance of maintaining mix.
• Placing – Pouring – Finishing . Screed . Float . Edger . Groover . Trowel – Protecting – Curing	The student should sufficiently underst by which concrete sets to be aware of t on a new pour of too much or too little or flowing water, and of the need for a curing. He should be familiar with all honeycomb. *The student should be able to place, co* *trowel a section of concrete, the resul* *being to yield standards of quality.*
• Use – Walks – Curbs – Slabs – Footings	

MASONRY

Suggested Time: 60 Hours

I — CONCRETE

TEACHING SUGGESTIONS

Composition
- Cement
- Aggregate
- Water
- Admixtures

The student should know that different types of cement and aggregates are available, as well as various proportions, to obtain concrete whose qualities fit it for specific uses. He should understand that mix specifications should be carefully followed. It is not necessary that he memorize types, properties, and designations of components.

Emphasize proper methods of storing and handling cement.

Preparation
- Proportions
- Equipment
  - Hand mix
  - Power mix
- Procedure

The student should be able to combine in proper sequence, both by hand and by machine, the specified components of a stated amount of concrete, the mix being of proper consistency for any teacher-selected use.

Emphasize the importance of maintaining the purity of the mix.

Placing
- Pouring
- Finishing
  - Screed
  - Float
  - Edger
  - Groover
  - Trowel
- Protecting
- Curing

The student should sufficiently understand the process by which concrete sets to be aware of the adverse effects on a new pour of too much or too little heat, and of rain or flowing water, and of the need for moisture during curing. He should be familiar with all means of avoiding honeycomb.

The student should be able to place, screed, float, and trowel a section of concrete, the resulting finish being to field standards of quality.

Use
- Walks
- Curbs
- Slabs
- Footings

- Walls
- Stairs
- Floors

- Patching
  - Trimming
  - Slurry
  - Filling

Preparing and filling holes and cracks i
is a must for masonry maintenance men.
should be adept at all phases of this wo
matching.

UNIT II —— PLASTER

- Composition
  - Water
  - Sand
  - Fiber
  - Aggregates
    - Expanded mica
    - Other
  - Cements
    - Limes
    - Gypsum
      - Plaster of paris
      - Keene's cement
    - Portland
  - Prepared mixes

It is not necessary that the students m
exact components of the various plaster
necessary that they know the basic compo
plaster, that special components for pa
exist, and where to find the specificati
type needed.

Emphasize the importance of following e
manufacturer's instructions for using p

- Base surfaces
  - Type
    - Metal lath
    - Wood lath
    - Gypsum board
    - Existing plaster
      - Holes
      - Cracks
      - Loose sections
  - Preparation
    - Cleaning
    - Dovetailing
    - Wetting

The student should be able to identify
plaster bases and describe the special
specific uses of each. He should be ab
an ability to prepare base surfaces for
plaster.

- Walls
- Stairs
- Floors

Patching
- Trimming
- Slurry
- Filling

Preparing and filling holes and cracks is a skill which is a must for masonry maintenance men. The student should be adept at all phases of this work except color matching.

II —— PLASTER

Composition
- Water
- Sand
- Fiber
- Aggregates
  - Expanded mica
  - Other
- Cements
  - Limes
  - Gypsum
    - Plaster of paris
    - Keene's cement
  - Portland
- Prepared mixes

It is not necessary that the students memorize the exact components of the various plasters. It *is* necessary that they know the basic components of any plaster, that special components for particular uses exist, and where to find the specifications for the type needed.

Emphasize the importance of following exactly, the manufacturer's instructions for using prepared mixes.

Base surfaces
- Type
  - Metal lath
  - Wood lath
  - Gypsum board
  - Existing plaster
    - Holes
    - Cracks
    - Loose sections
- Preparation
  - Cleaning
  - Dovetailing
  - Wetting

The student should be able to identify samples of common plaster bases and describe the special properties and specific uses of each. He should be able to demonstrate an ability to prepare base surfaces for application of plaster.

- Mixing
  - Proportions
  - Procedures
    - Tools
    - Equipment

The student should be able to mix, to fiel quality, any plaster for which specificati provided, and for which equipment and nece ponents are available.

Emphasize the importance of keeping compon tools and equipment, clean and free of imp

- Application
  - Base coat
  - Finish coat
  - Tools

While new plastering of comparatively larg should not be neglected, emphasis should b relatively small areas of existing plaster ability in patching should be at a higher them is entry-level ability in replasterin

UNIT III —— CERAMIC TILE

- Problems
  - Broken fixtures
  - Cracked tile
  - Lost grout

The setting of ceramic tile is a highly s field. Maintenance staff involvement is, usually limited to regrouting and to repl fixtures and the occasional cracked tile.

- Repair
  - Removing damaged units
    - Tools
    - Procedures
  - Resetting
    - Cutting
      - Tools
      - Procedures
    - Adhesives
      - Concrete plaster
      - Mastics
  - Regrouting
    - Mixing
    - Applying

Students should be made aware of the much difficulty inherent in repairing tile set plaster, than in that set in mastic.

The student should be able to demonstrate ability to remove damaged tile and fixtur the base surface, and set the replacement

The student should be able to demonstrate prepare and regrout an existing tile surf results equaling or exceeding field stand acceptable quality.

Mixing
- Proportions
- Procedures
  . Tools
  . Equipment

The student should be able to mix, to field standards of quality, any plaster for which specifications have been provided, and for which equipment and necessary components are available.

Emphasize the importance of keeping components, and tools and equipment, clean and free of impurities.

Application
- Base coat
- Finish coat
- Tools

While new plastering of comparatively large surfaces should not be neglected, emphasis should be on repairing relatively small areas of existing plaster. Entry-level ability in patching should be at a higher level of quality, than is entry-level ability in replastering.

III —— CERAMIC TILE

Problems
- Broken fixtures
- Cracked tile
- Lost grout

The setting of ceramic tile is a highly specialized field. Maintenance staff involvement is, therefore, usually limited to regrouting and to replacing broken fixtures and the occasional cracked tile.

Repair
- Removing damaged units
  . Tools
  . Procedures
- Resetting
  . Cutting
    Tools
    Procedures
  . Adhesives
    Concrete plaster
    Mastics
- Regrouting
  . Mixing
  . Applying

Students should be made aware of the much greater difficulty inherent in repairing tile set in concrete plaster, than in that set in mastic.

The student should be able to demonstrate an entry-level ability to remove damaged tile and fixtures, prepare the base surface, and set the replacement units.

The student should be able to demonstrate an ability to prepare and regrout an existing tile surface, the results equaling or exceeding field standards for acceptable quality.

UNIT IV —— BRICK AND BLOCK

- Pointing
  - Preparing the joint
    - Raking
    - Wetting
  - Mortar
    - Mixing
    - Applying
  - Tooling

Instruction in mixing of mortar should i
ment of an understanding of the properti
cements and the effects of each on the m

Students should be able to mix mortars t
specifications, and to a proper working
They should develop the ability to disti
mortar that has stiffened through evapor
can be retempered —— and mortar which h

The student should be able to demonstrat
ability to prepare joints, mix mortar, a
tool the joints.

- Alterations
  - Cutting openings
    - Equipment
      - Hand
      - Power
    - Procedure
  - Shoring
  - Safety

The students should gain experience in u
and equipment —— hand and power; chippin
boring. Hardhats, eyeshields, respirato
shoes must be mandatory equipment.

Instruction must emphasize proper shorin
is needed.

- Setting new units
  - Description
    - Size
    - Type
    - Absorptivity
  - Layout
    - Running bond
    - Random bond
    - Common bond
    - English bond
    - Other
  - Procedure
    - Methods
    - Tools

Instruction and daily use should acquain
with the more common styles, sizes, and s
brick and block, and with the relative a
each.

The student should be able to identify b
the common bonds represented by teacher-
photographs, or line samples. He should
out those bonds widely used in his geogr

The student should be able to lay up a s
and of block; joints uniform in size, al
plumb, and true.

V —— BRICK AND BLOCK

Pointing
- Preparing the joint
  - Raking
  - Wetting
- Mortar
  - Mixing
  - Applying
- Tooling

Instruction in mixing of mortar should include development of an understanding of the properties of various cements and the effects of each on the mortar.

Students should be able to mix mortars to provided specifications, and to a proper working consistency. They should develop the ability to distinguish between mortar that has stiffened through evaporation —— and can be retempered —— and mortar which has set.

The student should be able to demonstrate an entry-level ability to prepare joints, mix mortar, and point and tool the joints.

Alterations
- Cutting openings
  - Equipment
    - Hand
    - Power
  - Procedure
- Shoring
- Safety

The students should gain experience in use of all tools and equipment — hand and power; chipping, cutting, and boring. Hardhats, eyeshields, respirators, and safety shoes must be mandatory equipment.

Instruction must emphasize proper shoring, and why it is needed.

Setting new units
- Description
  - Size
  - Type
  - Absorptivity
- Layout
  - Running bond
  - Random bond
  - Common bond
  - English bond
  - Other
- Procedure
  - Methods
  - Tools

Instruction and daily use should acquaint the students with the more common styles, sizes, and shapes of brick and block, and with the relative absorptivity of each.

The student should be able to identify by name, any of the common bonds represented by teacher-selected sketches, photographs or live samples. He should be able to lay out those bonds widely used in his geographical area.

The student should be able to lay up a section of brick, and of block; joints uniform in size, all work level, plumb, and true.

- Flashings
- Vents

Instruction on flashings should include purpose, materials, the installation of thruwall flashing, and fabrication and installation of counter flashing.

- Washing
  - Materials
    - Acid
    - Soap solution
    - Dry cleaners
  - Equipment
  - Safety

Students should know why new masonry must be cleaned. They should be acquainted with the various types of cleaners, their properties, and proper methods of use. The teacher must emphasize safety and conformity to procedure. Demonstrating the effects of muriatic acid on samples of cloth, wood, and metal is frequently useful.

- Waterproofing
  - Materials
    - Chemical sealers
    - Bituminous sealers
  - Equipment
  - Procedure

Instruction should include why waterproofing is needed, what materials are used in what locations, and how the work is performed. Students should attain entry-level proficiency in applying parge coatings and at least the one type sealer most used in that geographical area.

ELECTRICITY

Suggested Time: 60 Hours

UNIT I —— ELECTRICAL ENERGY

TEACHING SUGGESTIONS

- Nature of Electricity
  - Electron theory
  - Production of AC
  - Transmission of current
    - Conductors
    - Insulators

Instruction should include an overvie
electrical theory, production of curre
mission of current.

The student should be able to classif
conductor or insulator, any commonly

- Safety
  - Shock
  - Fire
    - Type B/C extinguishers
  - Equipment
  - First-aid

Safety instruction is of supreme impor
occupational area. The student should
alert to the danger of shock and fire
of electrical energy. Use of safety
be unvaryingly enforced. All student
basic first-aid procedures; they must
to do in rescue procedure, what eating
must not be used on electrical fires.

UNIT II —— CIRCUITS

- Codes
  - National
  - Local

The Code is constantly changing; stude
taught to check its requirements rathe
memory. The teacher must be the final
each case, before power is switched on

- Conductors
  - Type
    - Armored
    - Nonmetallic
  - Sizes
  - Conduits

The shop inventory should include a re
all the various sizes and types of mat
encountered by electrical maintenance
should learn component identification
these materials.

ELECTRICITY

Suggested Time: 60 Hours

T I — ELECTRICAL ENERGY	TEACHING SUGGESTIONS
• Nature of Electricity – Electron theory – Production of AC – Transmission of current . Conductors . Insulators	Instruction should include an overview of basic electrical theory, production of current, and transmission of current. *The student should be able to classify as either conductor or insulator, any commonly available material.*
• Safety – Shock – Fire . Type B/C extinguishers – Equipment – First-aid	Safety instruction is of supreme importance in this occupational area. The student should be continually alert to the danger of shock and fire inherent in use of electrical energy. Use of safety equipment must be unvaryingly enforced. All students should know basic first-aid procedures; they *must* know what *not* to do in rescue procedure, what extinguishing agent must *not* be used on electrical fires, and *why* not.
T II — CIRCUITS	
• Codes – National – Local	The Code is constantly changing; students should be taught to check its requirements rather than rely on memory. The teacher must be the final "inspector" in each case, before power is switched on.
• Conductors – Type . Armored . Nonmetallic – Sizes – Conduits	The shop inventory should include a realistic supply of all the various sizes and types of materials commonly encountered by electrical maintenance men. Students should learn component identification through use of these materials.

- Connection boxes
  - Types
  - Sizes
  - Methods of installing

- Switches
  - Type
    - Mechanical
    - Mercury
    - Rheostat
  - Function
    - Single-pole
    - Three-way
    - Other

Students should have a general understan
several types of switches function, that
able to diagnose problems resulting fro

- Receptacles
  - Interior
  - Exterior
  - Higher voltage

Emphasize the importance of clean, tight
proper grounding.

- Connections
  - Live
    - Screw clamp
    - Spring clamp
  - Ground

*The student should be able to install a
representative circuits, diagnose and re
components, and reset tripped breakers,
forming to the Underwriters Code and sta
procedure.*

- Protective devices
  - Fuses
    - Plug
    - Cartridge
      - Unit
      - Replacable element
  - Breakers

Emphasize the importance of circuit pro
and of maintaining the correct rating fo
circuit.

Connection boxes
- Types
- Sizes
- Methods of installing

Switches
- Type
  - Mechanical
  - Mercury
  - Rheostat
- Function
  - Single-pole
  - Three-way
  - Other

Students should have a general understanding of how the several types of switches function, that they may be able to diagnose problems resulting from faulty switches.

Receptacles
- Interior
- Exterior
- Higher voltage

Emphasize the importance of clean, tight connections and proper grounding.

Connections
- Live
  - Screw clamp
  - Spring clamp
- Ground

The student should be able to install and connect representative circuits, diagnose and replace defective components, and reset tripped breakers, all work conforming to the Underwriters Code and standards of safe procedure.

Protective devices
- Fuses
  - Plug
  - Cartridge
    - Unit
    - Replacable element
- Breakers

Emphasize the importance of circuit protective devices, and of maintaining the correct rating for the particular circuit.

UNIT III —— ELECTRICAL DEVICES

- Illumination
  - Type
    - Incandescent
    - Fluorescent
  - Cleaning
  - Maintenance
    - Lighting elements
    - Diffusers
    - Reflectors
    - Ballasts
    - Emergency lighting units
  - Unit replacement

School facilities should provide permanent
and shop inventory should provide practice
will afford students experience in cleaning
repairing, and replacing both incandescent
lighting units.

- Motors
  - Cleaning
  - Lubricating
  - Replacing brushes
  - Checking connections

School facilities should provide numerous e
motors, in addition to shop samples, which
practice in motor maintenance.

- Alarm and signal systems
  - Device
    - Bell
    - Buzzer
    - Flasher
  - Checking connections
  - Checking switches
  - Routine maintenance

Emphasize the importance of proper maintena
achieving the total reliability necessary t
and signal systems.

It is not necessary that students be capabl
installing a system; they should be able to
and replace defective components.

The use of the scheduled-inspection maintena
should be taught.

I —— ELECTRICAL DEVICES

Illumination
Type
  Incandescent
  Fluorescent
Cleaning
Maintenance
  Lighting elements
  Diffusers
  Reflectors
  Ballasts
  Emergency lighting units
Unit replacement

School facilities should provide permanent installations, and shop inventory should provide practice units, which will afford students experience in cleaning, maintaining, repairing, and replacing both incandescent and fluorescent lighting units.

Motors
Cleaning
Lubricating
Replacing brushes
Checking connections

School facilities should provide numerous electric motors, in addition to shop samples, which will provide practice in motor maintenance.

Alarm and signal systems
Device
  Bell
  Buzzer
  Flasher
Checking connections
Checking switches
Routine maintenance

Emphasize the importance of proper maintenance in achieving the total reliability necessary to alarm and signal systems.

It is not necessary that students be capable of installing a system; they should be able to locate and replace defective components.

The use of the scheduled-inspection maintenance chart should be taught.

PLUMBING

Suggested Time: 45 Hours

UNIT I —— WATER SUPPLY	TEACHING SUGGESTIONS
• Piping — Material . Iron . Copper . Plastics — Sizes	Instruction and practice should sufficient the student with the common pipe materials properties of each, that he can identify m sight and describe the strengths and weakn The students should have a general knowled dard pipe diameters and lengths, and under and O.D. measurement.
• Fittings — Material — Sizes — Types . Elbows . Tees . Couplings . Unions . Other	*The student should be able to select from* *of any type, size, and material specified*
• Valves — Automatic . Check . Relief . Float . Other — Nonautomatic . Globe . Gate . Waste . Other — Maintenance . Washers . Packing	Students should be able to identify by nam any common type valve. Instruction should familiarization with internal features of and areas of probable trouble. Emphasize installation. Students should be able to replace washers and perform routine maintenance of common valves.

PLUMBING

Suggested Time: 45 Hours

— WATER SUPPLY	TEACHING SUGGESTIONS
Piping Material Iron Copper Plastics Sizes	Instruction and practice should sufficiently familiarize the student with the common pipe materials, and with the properties of each, that he can identify materials on sight and describe the strengths and weaknesses of each. The students should have a general knowledge of standard pipe diameters and lengths, and understand I.D. and O.D. measurement.
Fittings Material Sizes Types Elbows Tees Couplings Unions Other	*The student should be able to select from stock, fittings of any type, size, and material specified by the teacher.*
Valves Automatic Check Relief Float Other Nonautomatic Globe Gate Waste Other Maintenance Washers Packing	Students should be able to identify by name and function, any common type valve. Instruction should include familiarization with internal features of each type, and areas of probable trouble. Emphasize proper flow installation. Students should be able to replace washers and packing, and perform routine maintenance of common water system valves.

• Faucets — Plain — Mixing — Single-lever	Instruction should include fuller and grou but should concentrate on compression fauc The student should be able to remove and r type faucets. He should be able to diagno disassemble, repair, and reassemble all st pression faucet.
• Location — Buildings . Sinks and lavatories . Baths and showers . Sanitary facilities . Drinking fountains . Laundry units . Water heaters — Exterior . Lawn sprinklers . Drinking fountains . Sill cocks	Instruction and practice should acquaint the various types of terminals of water s and the maintenance and probable trouble Emphasize the importance of quickly locati shut-offs.
• Weather protection — Insulation — Draining	Students should be aware of the danger of exposed lines. They should know the metho ting, and be able to properly drain lines. have an understanding of safe thawing proc
• Hot water supply — Relief valve	*The student should be able to explain the* *of the pressure-temperature relief valve,* *needed.*
• Codes	

UNIT II —— DRAINAGE SYSTEM

• Functions — Main soil lines — Waste lines — Storm drains	Students should recognize the physical an differences of the various drain systems, identify examples of each.

. Faucets – Plain – Mixing – Single-lever	Instruction should include Fuller and ground-key faucets, but should concentrate on compression faucets. The student should be able to remove and replace all type faucets. He should be able to diagnose troubles, disassemble, repair, and reassemble all styles of compression faucet.
. Location – Buildings . Sinks and lavatories . Baths and showers . Sanitary facilities . Drinking fountains . Laundry units . Water heaters – Exterior . Lawn sprinklers . Drinking fountains . Sill cocks	Instruction and practice should acquaint student with the various types of terminals of water supply lines, and the maintenance and probable trouble areas of each. Emphasize the importance of quickly locating line shut-offs.
. Weather protection – Insulation – Draining	Students should be aware of the danger of freezing of exposed lines. They should know the methods of insulating, and be able to properly drain lines. They should have an understanding of safe thawing procedures.
. Hot water supply – Relief valve	*The student should be able to explain the functioning of the pressure-temperature relief valve, and why it is needed.*
. Codes	
T II —— DRAINAGE SYSTEM	
. Functions – Main soil lines – Waste lines – Storm drains	Students should recognize the physical and functional differences of the various drain systems, and be able to identify examples of each.

- Waste disposal system
  - Municipal
  - Septic
  - Codes

Instruction should include an overview of
and mechanics of both municipal and septic

Students should be able to use — but not
to memorize — plumbing codes.

- Materials
  - Iron
  - Copper
  - Glass
  - Plastic
  - Cast iron
  - Other

The student should be able to identify
selected sample drain as to material, si
use.

- Fittings
  - Couplings
  - Elbows
  - Tees
  - Increasers
  - Clean-outs
  - Other

- Traps
  - S
  - P
  - Drum
  - Other

The student should be able to identify
functioning of the various traps. He mu
understand the health and safety reasons
existence, and the principle on which the

- Stacks
  - Vent
  - Ventilation

Emphasize the importance of ventilating
Instruction should include the differenc
and ventilation stacks.

- Freeing stoppages
  - Waste lines
    - Chemicals
    - Force cup
    - Snake

Instruction should include probable probl
the nature of materials usually causing
each such point. Students should be inst
selection and safe use of chemical and m
of clearing stoppages, and made aware of
improper or careless use.

aste disposal system
Municipal
Septic
Codes

aterials
Iron
Copper
Glass
Plastic
Cast iron
Other

ittings
Couplings
Elbows
Tees
Increasers
Clean-outs
Other

raps
S
P
Drum
Other

tacks
Vent
Ventilation

reeing stoppages
Waste lines
. Chemicals
. Force cup
. Snake

Instruction should include an overview of the principles and mechanics of both municipal and septic systems.

Students should be able to use — but not be expected to memorize — plumbing codes.

The student should be able to identify any teacher-selected sample drain as to material, size, and proper uses.

The student should be able to identify and describe the functioning of the various traps. He must completely understand the health and safety reasons for their existence, and the principle on which they function.

Emphasize the importance of ventilating drains. Instruction should include the difference between vent and ventilation stacks.

Instruction should include probable problem points and the nature of materials usually causing stoppages at each such point. Students should be instructed in selection and safe use of chemical and mechanical means of clearing stoppages, and made aware of the hazards of improper or careless use.

- Main soil lines
  - . Snake
  - . Auger
  - . Fixture removal
- Traps
  - . Clean-out plug
  - . Trap removal

Emphasize the danger inherent in large volu
backed up —— especially vertically —— by
the importance of using correct methods of
under these conditions.

UNIT III —— JOINING COMPONENTS

The student should be able to demonstrate
ability to:

- . Galvanized iron
  - — Cutting
    - . Manual
    - . Machine
  - — Threading
    - . Equipment
    - . Procedure
  - — Joining
    - . Equipment
    - . Procedure
  - — Testing

Cut galvanized pipe within acceptable
of stated lengths, using each cutting
commonly used in the field.

Cut standard threads, using both manu

Join sections of threaded pipe and
fittings into a watertight unit.

- . Copper
  - — Cutting
  - — Sweating
    - . Preparation
    - . Joining
  - — Testing

Cut copper tubing to length, using
hacksaw.

Prepare components for joining, using
abrasives and flux.

Join sections of tubing and selected
a watertight unit, using solder and
butane torch.

- Main soil lines
  - Snake
  - Auger
  - Fixture removal
- Traps
  - Clean-out plug
  - Trap removal

Emphasize the danger inherent in large volumes of liquid backed up —— especially vertically —— by stoppages, and the importance of using correct methods of opening drains under these conditions.

T III —— JOINING COMPONENTS

The student should be able to demonstrate an entry-level ability to:

- Galvanized iron
  - Cutting
    - Manual
    - Machine
  - Threading
    - Equipment
    - Procedure
  - Joining
    - Equipment
    - Procedure
  - Testing

Cut galvanized pipes within acceptable tolerances of stated lengths, using each cutting tool commonly used in the field.

Cut standard threads, using both manual and power dies.

Join sections of threaded pipe and specified fittings into a watertight unit.

- Copper
  - Cutting
  - Sweating
    - Preparation
    - Joining
  - Testing

Cut copper tubing to length, using wheelcutter and hacksaw.

Prepare components for joining, using coated abrasives and flux.

Join sections of tubing and selected fittings into a watertight unit, using solder and propane or butane torch.

- Plastics
  - Clamping
  - Solvent welding
  - Testing
- Cast iron
  - Cutting
    - Hacksaw
    - Cold chisel
    - Pipe cutter
  - Leading
    - Packing
    - Pouring
    - Calking
  - Testing
- Supports
  - Straps
  - Hangers
  - Other

The student should be able to demonstrate an entry-level ability to:

Cut, fit, and clamp or solvent-weld components of plastic pipe to form a watertight unit.

Cut bell-and-spigot pipes within acceptable tolerances, using cold chisel and chain wheel cutter.

Assemble, pack, lead, and calk specified components into a unit which will remain watertight under specified gravitational or introduced pressures.

Provide supports as required by the type, material, diameter, and run length of pipe.

Emphasize use of eye, foot, and other safety equipment.

Instruction should include safeguarding against such hazards as spattering of hot flux and explosion of molten lead poured into wet bell-and-spigot joints.

CLIMATE CONTROL

Suggested Time: 45 Hours

UNIT I — INTRODUCTORY INFORMATION	TEACHING SUGGESTIONS
◦ Factors – Temperature . Conduction . Convection . Radiation – Humidity . Too high . Too low	Students should be instructed in what hea in which it travels, and why some materia and others are insulators. The teacher s to explain the molecular motion theory of Emphasize the relationship of relative hu ature in achieving comfort, and the effec effects of improper humidity.
◦ Application – Food storage – Laboratories – Electronics manufacturing – Personal comfort	The students should be made aware of the applications of climate control which are exacting than the obvious use in human co
◦ Climate control systems – Heating systems . Warm air . Hydronic . Radiant – Cooling systems . Forced air flow . Refrigeration – Humidifiers . Plate . Drum – Dehumidifiers	Instruction should include a comparative the mechanical, financial, esthetic, and aspects of each of the three main heating The student should be aware of the nature of evaporative cooling through forced air the advantages and disadvantages of cooli refrigerated air. The student should understand the princip ing of humidifiers and dehumidifiers, the of each type, and the effects of "lining" tor elements.

CLIMATE CONTROL

Suggested Time: 45 Hours

I —— INTRODUCTORY INFORMATION	TEACHING SUGGESTIONS
. Factors – Temperature . Conduction . Convection . Radiation – Humidity . Too high . Too low	Students should be instructed in what heat is, the ways in which it travels, and why some materials are conductors and others are insulators. The teacher should be prepared to explain the molecular motion theory of heat transfer. Emphasize the relationship of relative humidity to temperature in achieving comfort, and the effects and side effects of improper humidity.
. Application – Food storage – Laboratories – Electronics manufacturing – Personal comfort	The students should be made aware of the many important applications of climate control which are more technically exacting than the obvious use in human comfort.
. Climate control systems – Heating systems . Warm air . Hydronic . Radiant – Cooling systems . Forced air flow . Refrigeration – Humidifiers . Plate . Drum – Dehumidifiers	Instruction should include a comparative examination of the mechanical, financial, esthetic, and functional aspects of each of the three main heating systems. The student should be aware of the nature and limitations of evaporative cooling through forced air flow, and of the advantages and disadvantages of cooling through refrigerated air. The student should understand the principle and functioning of humidifiers and dehumidifiers, the effectiveness of each type, and the effects of "liming" on the evaporator elements.

UNIT II —— WARM AIR SYSTEMS

- Furnaces
  - Central
  - Room unit

- Fuels
  - Oil
  - Gas

- Heat flow
  - Plenum
  - Blower
    - Motor
    - Controls
  - Distribution ducts
  - Registers
  - Return ducts
  - Filters
    - Mechanical
    - Electronic

- Maintenance
  - Cleaning
    - Furnace
      - Combustion parts
      - Grills
    - Filters
    - Humidifiers
    - Registers
    - Thermostats
  - Lubricating
  - Restarting
  - Regulating
    - Thermostats
    - Fuel/air flow
    - Humidistats

Instruction should include room unit furna
emphasis must be on central systems.

The students should know the comparative m
problems of the common fuels, as well as r
different combustion equipment each requir

Emphasize safety procedures regarding leak

The student should be able to describe, or
writing, the circulation of air through a
air system, list the components, and explain
functioning of each.

The student should be able to describe, or
writing, how a forced warm air system is "
and the effects of duct size on distributi

The student should be able to perform all
maintenance procedures, in conformance wit
procedural charts.

The student should be able to repair or re
damaged sections of duct, and to assemble
new branch.

The student should be able to locate and r
components, and to install replacement par

— WARM AIR SYSTEMS

rnaces
entral
oom unit

els
il
as

Instruction should include room unit furnaces, although emphasis must be on central systems.

The students should know the comparative maintenance problems of the common fuels, as well as recognizing the different combustion equipment each requires.

Emphasize safety procedures regarding leaks and fires.

at flow
lenum
lower
Motor
Controls
istribution ducts
egisters
eturn ducts
ilters
Mechanical
Electronic

The student should be able to describe, orally or in writing, the circulation of air through a forced warm air system, list the components, and explain the functioning of each.

The student should be able to describe, orally or in writing, how a forced warm air system is "balanced," and the effects of duct size on distribution.

aintenance
leaning
Furnace
Combustion parts
Grills
Filters
Humidifiers
Registers
Thermostats
ubricating
estarting
egulating
Thermostats
Fuel/air flow
Humidistats

The student should be able to perform all routine maintenance procedures, in conformance with provided procedural charts.

The student should be able to repair or remove and replace damaged sections of duct, and to assemble and cut in a new branch.

The student should be able to locate and remove faulty components, and to install replacement parts.

UNIT III —— HYDRONIC SYSTEMS

- Boilers
  - Hot water
  - Steam

- Fuels
  - Gas
  - Oil

- Heat flow
  - Gravity flow
    - One pipe
    - Two pipe
  - Forced flow
  - Radiators
    - Convector cabinets
    - Baseboard cabinets
    - Radiant panels
    - Cast iron

- Maintenance
  - Cleaning
    - Furnace
      - Combustion parts
      - Boiler
    - Radiators
    - Lines
    - System controls
      - Thermostats
      - Aquastats
      - Relief valves
  - Lubrication
    - Circulators
  - Restarting
  - Regulating
    - Thermostats
    - Aquastats
    - Valves
    - Fuel delivery

The student should have a basic knowledge
hot water systems. He should not be expec
familiar with the details of the various t

The student should be able to demonstrate
ing of the functioning of the various dist
systems, and an ability to identify sample

Instruction should include a comparation o
the relative advantages of the various rad
and when connected to the different distri

Emphasize the importance of keeping radiat
dust mats.

The student should be able to perform all
maintenance procedures in conformance with
procedural charts and factory specificatio

The student should be able to locate fault
and repair or remove and replace parts whe
cedure is commonly within the province of
departments in the field.

Emphasize the importance of maintaining co
pressure, and of maintaining accurate func
pressure indicators and safety valves.

II —— HYDRONIC SYSTEMS

Boilers
Hot water
Steam

Fuels
Gas
Oil

Heat flow
Gravity flow
. One pipe
. Two pipe
Forced flow
Radiators
. Convector cabinets
. Baseboard cabinets
. Radiant panels
. Cast iron

Maintenance
Cleaning
. Furnace
  Combustion parts
  Boiler
. Radiators
. Lines
. System controls
  Thermostats
  Aquastats
  Relief valves
Lubrication
. Circulators
Restarting
Regulating
. Thermostats
. Aquastats
. Valves
. Fuel delivery

The student should have a basic knowledge of steam and hot water systems. He should not be expected to become familiar with the details of the various types and models.

The student should be able to demonstrate an understanding of the functioning of the various distribution systems, and an ability to identify samples by type.

Instruction should include a comparative examination of the relative advantages of the various radiators per se, and when connected to the different distribution systems.

Emphasize the importance of keeping radiators free of dust mats.

The student should be able to perform all routine maintenance procedures in conformance with provided procedural charts and factory specifications.

The student should be able to locate faulty components and repair or remove and replace parts where the procedure is commonly within the province of maintenance departments in the field.

Emphasize the importance of maintaining correct internal pressure, and of maintaining accurate functioning of pressure indicators and safety valves.

UNIT IV —— COOLING SYSTEMS

- Room unit
  - Types and sizes
    - Cooling needs
    - Structure design factors
    - Installation
  - Adjustments
    - Deflectors
    - Fan speed control
    - Vent/Cool controls
  - Maintenance
    - Cleaning
    - Winter protection

It is necessary that students possess a ... standing of the functioning of air condi...

The student should be aware of the consi... on cooling capacity of the nature of the ... structure, and the physical location of ...

The student should be able to install an... unit conditioners in accordance with man... instructions.

The student should be able to perform ro... seasonal maintenance in accordance with ... cedural charts, and these require descri... manufacturer's literature.

- Central systems
  - Types and sizes
    - Reciprocating
    - Centrifugal
    - Absorption
  - Function
    - Components
      - Motors
      - Pumps
      - Drives
      - Controls
  - Inspection
    - Visual
    - Tests
  - Maintenance
    - Repairs
    - Adjustments
    - Cleaning
    - Lubrication

The student should be well grounded in t... functional differences of the three type... systems, and the relative advantages of ...

The student should be able to verbally t... of a representative system, identifying ... and describing their function and functi...

The student should be able to perform al... seasonal maintenance in accordance with ... cedural charts and manufacturer's instru...

The students should be able to perform t... shooting and repair procedures authorize... facturer and described in his literature...

Note: Dual systems require maintenance —— routine and seasonal —— for both heating and cooling systems.

V —— COOLING SYSTEMS

Room unit
- Types and sizes
  - Cooling needs
  - Structure design factors
  - Installation
- Adjustments
  - Deflectors
  - Fan speed control
  - Vent/Cool controls
- Maintenance
  - Cleaning
  - Winter protection

It is necessary that students possess a basic understanding of the functioning of air conditioning units.

The student should be aware of the considerable effect on cooling capacity of the nature of the building, its structure, and the physical location of the unit itself.

The student should be able to install and adjust room unit conditioners in accordance with manufacturer's instructions.

The student should be able to perform routine and seasonal maintenance in accordance with provided procedural charts, and those require described in manufacturer's literature.

Central systems
- Types and sizes
  - Reciprocating
  - Centrifugal
  - Absorption
- Function
  - Components
    - Motors
    - Pumps
    - Drives
    - Controls
- Inspection
  - Visual
  - Tests
- Maintenance
  - Repairs
  - Adjustments
  - Cleaning
  - Lubrication

The student should be well grounded in the physical and functional differences of the three types of central system, and the relative advantages of each.

The student should be able to verbally trace a schematic of a representative system, identifying component parts and describing their function and functioning.

The student should be able to perform all routine and seasonal maintenance in accordance with provided procedural charts and manufacturer's instructions.

The students should be able to perform the troubleshooting and repair procedures authorized by the manufacturer and described in his literature.

Dual systems require maintenance —— routine and seasonal —— for both heating and cooling systems.

DRAWINGS AND SPECIFICATIONS

Suggested Time: 35 Hours

UNIT I —— DRAWINGS

TEACHING SUGGESTIONS

- Type
  - Architectural
    - Plot plan
    - Floor plan
    - Elevation
    - Section
    - Detail
  - Mechanical/Electrical
    - Pictorial
    - Assembly
    - Exploded
    - Detail
    - Schematic

Instruction and practice should enable t
identify a drawing by name and to state
istics which make it a distinct type.

The student must be able to correctly in
it is not necessary that he be able to m

- Interpretation
  - Notation
  - Symbols
  - Line weights
  - Measurement
    - Stated
    - Scaled

*The student should be able to locate and
teacher-specified point of information
provided drawing.*

UNIT II —— SPECIFICATIONS

- Construction
  - Materials
  - Procedures
  - Standards of quality

Students should have an overall knowled
and breadth of information contained in

Emphasize that, where drawings and speci
agree, specifications take precedence.

DRAWINGS AND SPECIFICATIONS

Suggested Time: 15 Hours

T I — DRAWINGS

TEACHING SUGGESTIONS

- Type
  - Architectural
    - Plot plan
    - Floor plan
    - Elevation
    - Section
    - Detail
  - Mechanical/Electrical
    - Pictorial
    - Assembly
    - Exploded
    - Detail
    - Schematic

Instruction and practice should enable the student to identify a drawing by name and to state the characteristics which make it a distinct type.

The student must be able to correctly interpret drawings; it is not necessary that he be able to make drawings.

- Interpretation
  - Notation
  - Symbols
  - Line weights
  - Measurement
    - Stated
    - Scaled

The student should be able to locate and interpret any teacher-specified point of information contained on a provided drawing.

IT II — SPECIFICATIONS

- Construction
  - Materials
  - Procedures
  - Standards of quality

Students should have an overall knowledge of the depth and breadth of information contained in specifications.

Emphasize that, where drawings and specifications do not agree, specifications take precedence.

- Manufacturers'
  - Equipment
    - Installation
    - Maintenance
    - Repair
  - Supplies
    - Use
    - Storage
  - Parts lists

The student should be able to locate and interpret any teacher-specified point of information contained in provided specifications.

It is not necessary that the student be able to write legally acceptable specifications. He should be able to write complete, clear, purchase orders.

BOOKKEEPING AND ESTIMATING

Suggested Time: 15 Hours

UNIT I — BASIC ACCOUNTING	TEACHING SUGGESTIONS
• Supplies inventory	Students should be capable of keeping a run of stock, of equipment, and of maintenance
• Equipment and plant maintenance — In-house — Contracted	
• Insurance — Required by law — Optional	Instruction should include familiarization required and optional, and with maintenance records.
• Utilities — Fuels — Electricity — Water — Waste disposal . Garbage . Trash . Sewerage	Students should be aware of the need for co of utilities expenditures, for proof of pay estimating future expenditures, and for ope economy.
• Labor — Term . Staff . Ad hoc — Records . Employment Job interviews Resumés Proficiency credentials Union memberships Youth working papers Terminations	Students should be provided broad backgroun of this aspect of supervision and managemen should be made aware of the legal ramificat employment and compensation records.

BOOKKEEPING AND ESTIMATING

Suggested Time: 15 Hours

— BASIC ACCOUNTING	TEACHING SUGGESTIONS
upplies inventory	Students should be capable of keeping a running inventory of stock, of equipment, and of maintenance work performed.
quipment and plant maintenance In-house Contracted	
nsurance Required by law Optional	Instruction should include familiarization with coverages, required and optional, and with maintenance of necessary records.
tilities Fuels Electricity Water Waste disposal Garbage Trash Sewerage	Students should be aware of the need for complete records of utilities expenditures, for proof of payment, for estimating future expenditures, and for operational economy.
abor Term Staff Ad hoc Records Employment Job interviews Resumés Proficiency credentials Union memberships Youth working papers Terminations	Students should be provided broad background knowledge of this aspect of supervision and management. They should be made aware of the legal ramifications of employment and compensation records.

Compensation
Payroll
Vacation
Sick leave
Accident reports

UNIT II —— ESTIMATING

- Operational supplies
  - Custodial
  - Groundskeeping
  - Repair and maintenance
    - Equipment
    - Buildings

- Contingency supplies
  - Emergencies
  - Acts of nature
  - Unexpected crowds

- Labor
  - Staff
    - Full-time
    - Part-time
  - Subcontracted

- Utilities
  - Water
  - Power
    - Fuels
    - Electricity
  - Waste disposal
    - Sewer taxes
    - Garbage/trash collection

Instruction should include methods of
needs.

Students should be capable of demonst
estimating procedure, basing figures
of previous expenditures. Greater ac
reported in estimating supplies than
but at the entry-level correct proced
important than resulting figures.

Compensation
- Payroll
- Vacation
- Sick leave
- Accident reports

II —— ESTIMATING

Operational supplies
- Custodial
- Groundskeeping
- Repair and maintenance
  - Equipment
  - Buildings

Contingency supplies
- Emergencies
- Acts of nature
- Unexpected crowds

Labor
- Staff
  - Full-time
  - Part-time
- Subcontracted

Utilities
- Water
- Power
  - Fuels
  - Electricity
- Waste disposal
  - Sewer taxes
  - Garbage/trash collection

Instruction should include methods of estimating future needs.

Students should be capable of demonstrating good estimating procedure, basing figures on provided records of previous expenditures. Greater accuracy should be expected in estimating supplies than in labor time/costs, but at the entry-level correct procedure is more important than resulting figures.

RESOURCE LIST

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